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PROCEEDINGS.

Eight hundred and fifty-first Meeting.

May 24, 1892. — ANNUAL MEETING.

The PRESIDENT in the chair.

A quorum was not present and it was

Voted, To meet on adjournment on Wednesday the 15th of June.

The Report of the Council was read.

The Treasurer and the Librarian presented their annual reports.

The following papers were presented by title: —

Note on Orthogonal Matrices. By Henry Taber.

On the least Number of Vibrations necessary to determine Pitch. By Charles R. Cross and Margaret E. Maltby.

On some Experiments with the Phonograph, relating to the Vowel Theory of Helmholtz. By Charles R. Cross and George E. Wendell.

An Investigation of the Excursion of the Diaphragm of a Telephone Receiver. By Charles R. Cross and Arthur M. Mansfield.

New Phænogams collected in New Mexico by C. G. Pringle in 1890 and 1891. By Benjamin L. Robinson.

Eight hundred and fifty-second Meeting.

June 15, 1892. — ADJOURNED STATED MEETING.

The PRESIDENT in the chair.

The Reports of the Council, the Treasurer, and the Librarian, read at the last meeting, were accepted.

On the motion of the Treasurer it was

Voted, To make the following appropriations from the income of the general fund:—

For general expenses	\$2,200
For publications	2,100
For the library	1,500
For the expenses of meetings	200

The following gentlemen were elected members of the Academy:—

Solon Irving Bailey, of Cambridge, to be a Resident Fellow in Class I., Section 2.

George Dunning Moore, of Worcester, to be a Resident Fellow in Class I., Section 3.

Charles Edward Faxon, of Boston, to be a Resident Fellow in Class II., Section 2.

Benjamin Lincoln Robinson, of Somerville, to be a Resident Fellow in Class II., Section 2.

Arthur Bliss Seymour, of Cambridge, to be a Resident Fellow in Class II., Section 2.

Roland Thaxter, of Cambridge, to be a Resident Fellow in Class II., Section 2.

John Elbridge Hudson, of Boston, to be a Resident Fellow in Class III., Section 1.

Charles Pickering Bowditch, of Boston, to be a Resident Fellow in Class III., Section 2.

Edward Robinson, of Boston, to be a Resident Fellow in Class III., Section 2.

Edmund Hatch Bennett, of Boston, to be a Resident Fellow in Class III., Section 3.

Mellen Chamberlain, of Chelsea, to be a Resident Fellow in Class III., Section 3.

Andrew McFarland Davis, of Cambridge, to be a Resident Fellow in Class III., Section 3.

Ephraim Emerton, of Cambridge, to be a Resident Fellow in Class III., Section 3.

Silas Marcus Macvane, of Cambridge, to be a Resident Fellow in Class III., Section 3.

Charles Card Smith, of Boston, to be a Resident Fellow in Class III., Section 3.

Francis Bartlett, of Boston, to be a Resident Fellow in Class III., Section 4.

John Bartlett, of Cambridge, to be a Resident Fellow in Class III., Section 4.

Thomas Wentworth Higginson, of Cambridge, to be a Resident Fellow in Class III., Section 4.

Percival Lowell, of Brookline, to be a Resident Fellow in Class III., Section 4.

Fabian Franklin, of Baltimore, to be an Associate Fellow in Class I., Section 1, in place of the late William Ferrel.

Emory McClintock, of New York, to be an Associate Fellow in Class I., Section 1, in place of the late Thomas Hill.

Edward Emerson Barnard, of San José, to be an Associate Fellow in Class I., Section 2, in place of the late Julius E. Hilgard.

James Edward Keeler, of Allegany, to be an Associate Fellow in Class I., Section 2, in place of the late Christian H. F. Peters.

Edward Williams Morley, of Cleveland, to be an Associate Fellow in Class I., Section 3, in place of the late John LeConte.

Cyrus Ballou Comstock, of Washington, to be an Associate Fellow in Class I., Section 4, in place of the late George W. Cullum.

Alfred Richard Cecil Selwyn, of Ottawa, to be an Associate Fellow in Class II., Section 1, in place of the late John C. Fremont.

William Trelease, of St. Louis, to be an Associate Fellow in Class II., Section 2, in place of the late Leo Lesquereux.

George Vasey, of Washington, to be an Associate Fellow in Class II., Section 2.

William Keith Brooks, of Baltimore, to be an Associate Fellow in Class II., Section 3, in place of the late Joseph Leidy.

Thomas Ruggles Pynchon, of Hartford, to be an Associate Fellow in Class III., Section 1, in place of the late Noah Porter.

David Ames Wells, of Norwich, Connecticut, to be an Associate Fellow in Class III., Section 3.

Johan August Hugo Gylden, of Stockholm, to be a Foreign Honorary Member in Class I., Section 1, in place of the late John C. Adams.

William Huggins, of London, to be a Foreign Honorary Member in Class I., Section 2, in place of the late Sir George B. Airy.

Hermann Carl Vogel, of Potsdam, to be a Foreign Honorary Member in Class I., Section 2, in place of the late Eduard Schönfeld.

Victor Meyer, of Heidelberg, to be a Foreign Honorary Member in Class I., Section 3, in place of the late Wilhelm E. Weber.

Henry Clifton Sorby, of Sheffield, to be a Foreign Honorary Member in Class II., Section 1, in place of the late Sir Andrew C. Ramsay.

Baron Ferdinand von Mueller, of Melbourne, to be a Foreign Honorary Member in Class II., Section 2, in place of the late Carl J. Maximowicz.

Eduard Strasburger, of Bonn, to be a Foreign Honorary Member in Class II., Section 2, in place of the late Carl W. von Naegeli.

The annual election resulted in the choice of the following officers: —

JOSIAH P. COOKE, *President*.
 AUGUSTUS LOWELL, *Vice-President*.
 CHARLES L. JACKSON, *Corresponding Secretary*.
 WILLIAM WATSON, *Recording Secretary*.
 ELIOT C. CLARKE, *Treasurer*.
 HENRY W. HAYNES, *Librarian*.

Councillors.

WILLIAM E. STORY,	} of Class I.
CHARLES R. CROSS,	
WILLIAM R. LIVERMORE,	

DAVID W. CHEEVER,	} of Class II.
HENRY P. WALCOTT,	
GEORGE L. GOODALE,	

LUCIEN CARR,	} of Class III.
ANDREW P. PEABODY,	
BARRETT WENDELL,	

Rumford Committee.

WOLCOTT GIBBS,	BENJAMIN O. PEIRCE,
JOHN TROWBRIDGE,	EDWARD C. PICKERING,
ERASMUS D. LEAVITT,	CHARLES R. CROSS,
AMOS E. DOLBEAR.	

Member of the Committee of Finance.

AUGUSTUS LOWELL.

The President appointed the following Standing Committees:—

Committee of Publication.

CHARLES L. JACKSON,	WILLIAM G. FARLOW,
HORACE E. SCUDDER.	

Auditing Committee.

HENRY G. DENNY,	JOHN C. ROPES.
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The following papers were presented:—

On the Matrical Equation $\Omega \phi = \phi \Omega'$. By Henry Taber.

On the so called Hall Effect in several Metals at widely varying Temperatures. By A. L. Clough and E. H. Hall.

On the Thermal Conductivity of Cast Iron and of Cast Nickel. By E. H. Hall.

A letter was read from the General Committee of the World's Congress Auxiliary on Mathematics and Astronomy, calling the attention of the Academy to its printed preliminary address.

Eight hundred and fifty-third Meeting.

October 12, 1892. — STATED MEETING.

The PRESIDENT in the chair.

In the absence of the Recording Secretary, Major W. R. Livermore was elected Secretary *pro tempore*.

The Corresponding Secretary read letters from Messrs. J. Bartlett, Bennett, Bowditch, Chamberlain, Higginson, Hudson, Lowell, Moore, Robinson, and Smith, accepting Fellowship; from Messrs. Barnard, Comstock, Keeler, McClintock, Pynchon, Selwyn, Trelease, and Vasey, acknowledging election as Associate Fellows; and from Messrs. Gylden, Huggins, Sorby, Strasburger, and Vogel, acknowledging election as Foreign Honorary Members.

The President announced the decease of James Bicheno Francis and John Greenleaf Whittier, Fellows; and of Sir William Bowman and Lord Tennyson, Foreign Honorary Members.

On motion, it was

Voted, To meet on adjournment on the second Wednesday in November.

The following papers were presented:—

On Turmerol. By Charles L. Jackson.

On Alaska. By Josiah P. Cooke.

Eight hundred and fifty-fourth Meeting.

November 9, 1892. — ADJOURNED STATED MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary announced the death of Professor Giovanni Flechia, Vice-President of the Royal Academy of Science at Turin; also, that of Commander Antonio Todardo, Director of the Royal Botanic Garden at Palermo. He read a letter inviting members of the Academy to attend the seventy-fifth anniversary of the Natural History Society of Osterland, at Altenburg, and one from Baron von Mueller, acknowledging his election as Foreign Honorary Member.

The Recording Secretary proposed an amendment of the first section of Chapter VIII. of the Statutes, and, on his motion, it was

Voted, That this recommendation be referred to a committee, with instructions to report at the next stated meeting.

The President appointed the Recording Secretary, Dr. Folsom, and Major Livermore members of this committee.

The following papers were presented: —

Characteristics of the Mycological Flora of North America. By William G. Farlow.

Mechanical Models of Electro-magnetic Phenomena. By Amos E. Dolbear.

The following papers were presented by title: —

On certain Products of the Dry Distillation of Wood: Methylfurfurol and Methylpyromucic Acid. By Henry B. Hill and Walter L. Jennings.

On Certain Derivatives of Pyromucamide. By Charles E. Saunders.

On Trianilidodinitrobenzol and some related Compounds. By C. Loring Jackson and H. N. Herman.

On the Tropical Faunal Element of our Southern Nymphalinae systematically treated. By Samuel H. Scudder.

Eight hundred and fifty-fifth Meeting.

January 11, 1893. — STATED MEETING.

The PRESIDENT in the chair.

The committee appointed to consider the proposed amendment of the Statutes reported favorably and it was accordingly

Voted, To amend Section 1 of Chapter VIII. of the Statutes by substituting the word "second" for the words "day next preceding the last." The section thus amended reads as follows:—

"1. There shall be annually four stated meetings of the Academy; namely, on the second Wednesday in May (the Annual Meeting), on the second Wednesday in October, on the second Wednesday in January, and on the second Wednesday in March; to be held in the Hall of the Academy, in Boston. At these meetings only, or at meetings adjourned from these and regularly notified, shall appropriations of money be made, or alterations of the statutes or standing votes of the Academy be effected."

The President addressed the Academy as follows:—

I have to report to the Academy the death of three of our members.

Professor Eben Norton Horsford died of heart disease at his residence in Cambridge on Sunday, the first day of the new year. He was born at Moscow, Livingston County, New York, on July 27, 1818, and was therefore in the seventy-fifth year of his age. As a boy, he enjoyed the advantages of good school education, and graduated from the Rensselaer Institute in 1837. Subsequently he taught for four years in the Albany Female Academy, and lectured on chemistry in Newark College, Delaware. Thus acquiring a strong interest in chemical science, he sought eagerly the remarkable advantages then offered for the study of this subject at Liebig's famous laboratory at Giessen, in Germany. Here, under the direction of Liebig, he carried out successfully and published an important investigation on glyccoll, and during two years was associated with such men as Hofmann, Wurtz, Williamson, and Frankland, who afterwards became chiefs among the makers of our modern science. With these earnest fellow students Mr. Horsford formed intimate friendships, and they ever entertained for him a warm regard.

Returning home in 1846 with the warmest recommendations from his great teacher, Mr. Horsford was at once called to direct the chemical department of the Scientific School then just established at Harvard College. The funds of the Rumford Foundation were, perhaps not wholly justifiably, diverted to the support of this department, and Mr. Horsford was appointed Rumford Professor. He entered on his duties with great zeal, and inspired such confidence in Mr. Abbott Lawrence as to lead that noble benefactor to build a large chemical laboratory, on the most approved German plan, under the supervision of the enthusiastic teacher, and the original laboratory of the Lawrence Scientific School was far in advance of any similar establishment in the United States at the time.

The outlook for the new laboratory at the beginning was most auspicious, and the young director had an earnest zeal for purely scientific investigation. But, unfortunately, the ways and means had not been adequately provided. Not only there was not sufficient income to defray the expenses of so large an establishment, but it was impossible to provide for the necessities of a growing family on the wretched stipend of \$1,500 a year. These necessities forced Professor Horsford, as they have many another man, to endeavor to supplement his resources by commercial work, and, however much we may deem such work incompatible with the highest interests of a learned institution, our whole sympathy is with the struggling teacher who is forced by such circumstances to loose his hold on higher ideals. As the commercial work widened, Professor Horsford saw that it was incompatible with the full discharge of the duties of his office, and in 1863 he resigned his professorship, in honorable distinction from the too frequent practice of using a college position as a basis for commercial work.

It is with great pleasure that we follow Professor Horsford into commercial life, and witness the reward that came to intelligence, perseverance, and industry. If he suffered the trial of renouncing the ideals of youth, he won the great rewards which come from large liberality and active benevolence wisely ordered; and his name will long be cherished in loving remembrance by many hearts. Professor Horsford was elected a Fellow of this Academy on May 25, 1847.

John Strong Newberry was born in Windsor on December 22, 1822. At an early age his parents removed to Ohio, and he was educated at the Western Reserve College and the Cleveland Medical School. After supplementing his professional education in Europe, he settled as a physician in Cleveland; but in 1855 his interest in

geology led him to join, nominally as surgeon, but in reality as geologist, the exploring party sent out under the command of Lieutenant Robert S. Williamson to examine the country between San Francisco and the Columbia River, and the result of his work appears in the sixth volume of the Pacific Railroad Surveys, published by the government in 1857. He next joined the expedition under Lieutenant Ives to explore the Colorado, and spent nearly a year at the mouth of the Grand Cañon in studying the geology and natural history of that territory. His observations formed the most interesting material that was gathered by the expedition, and more than one half of the Report upon the Colorado River, published by the government in 1861, was written by him; and it was doubtless the interest aroused by this account that led Major Powell, ten years later, to make his famous explorations of the great cañons of the Colorado.

During the war of the Rebellion, Professor Newberry was one of the most efficient directors of the United States Sanitary Commission. After the war was over, he accepted the Chair of Geology and Palæontology at Columbia College, and discharged the duties until December, 1890, when a sudden stroke of paralysis incapacitated him for further work. From this attack he partially recovered, but it was the beginning of the end. Professor Newberry was elected an Associate Fellow of the Academy on March 9, 1887.

The death of Sir Richard Owen removes from the ranks of English men of science one who has been a prominent figure for over sixty years. Born in 1804, his life has covered almost the whole of a century remarkable for its scientific achievements. Already, in 1851, when the writer first met him, he had published his famous catalogue of the Hunterian Museum, and done the larger part of the work which has rendered him so illustrious as a physiologist and anatomist. Although at times regarded as overbearing by his immediate associates, he was all kindness to a stranger, and I shall never forget our pleasant intercourse. He held in very high esteem our own distinguished comparative anatomist, the late Jeffries Wyman, by whom I was introduced to his notice. The last few years he has lived in retirement at Sheen Lodge, Richmond Park, granted him by the royal family, by whom he was highly esteemed, and his death at nearly ninety is simply the natural close of a completed career. Owen was elected a Foreign Honorary Member of this Academy on November 14, 1855, and is the oldest name on our honorary list with one exception, — Pascual de Gayangos, elected in 1842.

The Corresponding Secretary read a letter from the Hermite Committee, announcing their intention to give a medal to M. Hermite on his seventieth birthday, and inviting subscriptions; also, a letter from the American Philosophical Society, inviting the Academy to send a delegate to the celebration of its one hundred and fiftieth anniversary. This invitation was accepted, and the President was requested to appoint a delegate.

Messrs. Francis H. Storer, Charles L. Jackson, Thomas M. Drown, Arthur M. Comey, and Leonard P. Kinnicutt were appointed a committee to consider and report upon methods for the management of the C. M. Warren trust for the encouragement of chemical research.

Upon the recommendation of the Rumford Committee, it was

Voted, That an appropriation of two hundred and fifty dollars (\$250) be made to Professor Daniel Shea, of Illinois State University, for an investigation upon the effect of a magnetic field on light.

Voted, That an appropriation of two hundred dollars (\$200) be made to Professor B. O. Peirce for an investigation on the conduction of heat.

The following papers were read:—

Notice of the late James B. Francis. By Hiram F. Mills.

Note on an Approximate Trigonometric Expression for the Fluctuations in Temperature of the Steam in an Engine Cylinder. By Edwin H. Hall.

The following papers were presented by title:—

Contributions from the Herbarium of Harvard University: 1. New and little known Plants collected on Mount Orizaba in the Summer of 1891. By Henry E. Seaton. 2. Additions to the Phænogamic Flora of Mexico, discovered by C. G. Pringle in 1891 and 1892. By B. L. Robinson and H. E. Seaton.

On the Excursion of the Diaphragm of a Telephone Receiver. By Charles R. Cross and Henry M. Phillips.

A Revision of the Atomic Weight of Barium. First Paper: The Analysis of Baric Bromide. By Theodore Wm. Richards.

On the Development of the Spermatogonium of *Cæoma nitens* (Schw.). By H. M. Richards.

Certain Microscopic Observations in regard to the Caoutchoucs. By H. F. Lueders.

Microchemical Behavior of the Organized Proteids in the Seeds of *Gossypium*, with a New Test for Associated Oils. By H. F. Lueders.

Microscopic Characters of the Fossil Resin of *Agathis Australis*. By G. L. Goodale.

Eight hundred and fifty-sixth Meeting.

February 8, 1893.

The PRESIDENT in the chair.

The Corresponding Secretary read the following letters: from the Royal Academy of Sciences of Turin, announcing the terms of competition for the ninth Bressa Prize; from the Imperial Russian Mineralogical Society of St. Petersburg, announcing the death of its Honorary Director, Nicholas Koscharow, and of its Honorary Member, Axel Gadoline; also, from a committee at Altenburg, inviting subscriptions to the Brehm-Schlegel monument.

The President announced the death of the Rt. Rev. Phillips Brooks, D. D., a Resident Fellow, in the following words:—

That great and noble man whose recent death has caused such a profound sensation in this community was a Resident Fellow of our Academy in the section of Philosophy and Jurisprudence. Except on a few special occasions, he never attended our meetings; and his activities were in fields very different from those we habitually cultivate. But he welcomed, with as great pleasure as any of us, all advances of knowledge, and has shown his sympathy by giving to our Academy the support of his name and influence since 1878.

In his wonderful intuitive power and his great breadth of view, Phillips Brooks always seemed to me to resemble our late Foreign Honorary Member, the illustrious English poet, who died only a few weeks before him. Tennyson was conspicuously the poet of modern science. Although a son of the Church, he was the first of the poets

to appreciate the philosophic doubts which the discoveries of modern science had opened ; but though he pointed out the larger view which these unfold, it

“Is given in outline and no more.”

Brooks, like Tennyson, preached the Gospel of reconciliation, but his spiritual insight was so clear that all men could see the light.

“And what I am beheld again
What is, and no man understands ;
And out of darkness came the hands
That reach thro’ nature moulding men.”

The following papers were read : —

Obituary Notice of Sir William Bowman, Bart. By Henry W. Williams.

An Account of the Spectral Well in Virginia. By Amos E. Dolbear.

On the Preparation of Nickel Tetracarbonyl. By Francis G. Benedict.

Further Evidence of the Definiteness of the Law of Constant Proportions in Chemistry. By Henry F. Brown.

The following paper was presented by title : —

Studies on the Transformations of Moths of the Family of Saturniidæ. By Alpheus S. Packard.

Eight hundred and fifty-seventh Meeting.

March 8, 1893. — STATED MEETING.

The PRESIDENT in the chair.

The President announced the death of John Montgomery Batchelder and Henry Wheatland, Resident Fellows, and of Frederick Augustus Genth and William Petit Trowbridge, Associate Fellows.

Dr. Henry W. Williams gave an informal talk on the revelations obtained by means of the ophthalmoscope, illustrated by models and diagrams.

A quorum for business was not present, and it was

Voted, To meet on adjournment on the 12th of April.

Eight hundred and fifty-eighth Meeting.

April 12, 1893. — ADJOURNED STATED MEETING.

The PRESIDENT in the chair.

The President announced the death since the last meeting of Andrew Preston Peabody, and George Cheyne Shattuck, Resident Fellows; William Holmes Chambers Bartlett, and George Vasey, Associate Fellows; and of Alphonse Louis Pierre Pyramus de Candolle, Foreign Honorary Member.

The following gentlemen were elected members of the Academy:—

Samuel Cabot, of Brookline, to be a Resident Fellow in Class I, Section 3.

Henry Helm Clayton, of Milton, to be a Resident Fellow in Class II., Section 1.

John Elliott Pillsbury, of Boston, to be a Resident Fellow in Class II., Section 1.

John Henry Wright, of Cambridge, to be a Resident Fellow in Class III., Section 2.

The following report was presented:—

The provisional committee appointed to consider methods of managing the "Cyrus Moors Warren Trust for the encouragement of Chemical Research" respectfully recommend to the Academy that a standing committee be appointed to be known as the

C. M. WARREN COMMITTEE,

which shall consist of seven (7) members to be chosen by ballot at the Annual Meeting of the Academy, vacancies to be filled at any stated meeting of the Academy after due notice has been given at a previous meeting of the proposed election.

We recommend that the C. M. Warren Committee should be directed by the Academy:—

I. To invite applications for pecuniary assistance from any persons wishing to engage in research in any department of chemistry; that the Committee should consider these appli-

cations carefully and recommend to the Academy for its favorable action such applications as seem to be practicable and to be worthy of aid. We urge that preference should be given to work upon petroleum products and hydrocarbons, because of Mr. Warren's special interest in the study of these substances.

II. We recommend that the Committee should be authorized to suggest subjects that need to be investigated, and be directed to employ a chemist, or several chemists, at its discretion, to work out definite stated problems, under the supervision of the Committee. Preference should naturally be given to actual laboratory work, but research in the literature of chemistry, and other forms of literary labor, should not be excluded when in the opinion of the Committee the elucidation of a problem might be promoted by these means.

III. The Committee should be empowered on occasion to purchase materials and apparatus—including printed or written memoirs—which may be needed for the investigations which may be recommended, and should be permitted to employ assistants when necessary.

IV. We are of opinion that no medal or other form of prize should be given or offered by the Academy in connection with the Warren Trust.

All of which is respectfully submitted by

F. H. STORER.
C. L. JACKSON.
A. M. COMEY.
L. P. KINNICUTT.

The report was accepted and adopted by the Academy.

The following papers were presented by title:—

Contributions from the Gray Herbarium of Harvard University: The North American *Sileneæ* and *Polycarpeæ*. By B. L. Robinson.

The "Hall Effect" at widely varying Temperatures in several Metals. By A. L. Clough and E. H. Hall.

On the Representation of Real Orthogonal Transformations. By Henry Taber.

On Hemiacetals from Substituted Chloranils. By C. Loring Jackson and H. S. Grindley.

On Substituted Crotonolactones and Mucobromic Acid. By H. B. Hill and R. W. Cornelison.

Notice was given by the Recording Secretary of a proposed change in the second section of Chapter VIII. of the statutes. This recommendation was referred to a committee, consisting of the Recording Secretary, the Corresponding Secretary, and the Librarian.